Cl Speciation in Solgel Glass

P. Citrin, P. Northrup, D. Trevor, and P. Trevor (Bell Labs)

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Solgel-derived silica has significantly higher viscosity and greater temperature dependence than fumed-based silica, problems in fiber manufacturing that have historically been attributed to the dominant impurity, Cl, existing in two different chemical forms (speciations): Cl chemically bonded to Si and interstitial (nonbonded) Cl_2. This hypothesis seemed particular appealing because the surface area of silica particles would be sensitive to different Cl species, implying that two solgel-derived silica bodies could have the same Cl concentrations with different viscosities, as had been observed.

X-ray absorption measurements from solgel preforms with very high (>8000 ppm) and modest (3000 ppm) Cl concentrations (both azimuthally and radially uniform) showed unambiguously that neither exhibit any evidence of Cl_2; the charge state of Cl is identical in both and similar to that in NaCl. Chlorine speciation in solgel-derived silica is therefore not responsible for the observed anomalous viscosity.